

# ***Multifunction Analyzer***

## Hardware Users Manual

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## IMPORTANT NOTICE

- 1. This product is localized for used country.**  
**If you take out to another country, please your country's abide by the law of export.**
- 2. This product is used for general purpose, so it can not to use for development for products that is high reliability needed. (ex: Airplane, Space, Car, Medical...)**  
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- 5. May be different results in your environment, depending on measurement conditions can be obtained.**
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This document has important terms for safeguard your life and escape from accidents.  
Please read carefully.

## 1.1 Terms of use

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                        |                                                                                                                                                                                                                                |                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|  <b>Warning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                        | <p>Always observe the following instructions. Failure to do so may result in electrical shock or other dangers that may lead to serious injury or the loss of life.</p>                                                        |                                                                                                                        |
| <p>When connect/disconnect option, open the part indicated on the manual only, make sure not to open any other parts that may cause electrical shock.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |  <p>Prohibit</p>      | <p>No disassembling, no remodeling, no repairing. To repair, please ask your Sohwa &amp; Sophia Technologies sales office or distributor.</p>                                                                                  |  <p>No Disassembling</p>            |
| <p>Turn off power and pull out plug from power outlet immediately when there are any abnormal smell, smoke or abnormal electrical noise to avoid resulting in fire. Ask your Sohwa &amp; Sophia Technologies Technology sales office or distributor to ask to repair it.</p>                                                                                                                                                                                                                                                                                                                 |  <p>Pull out plug</p> | <p>Turn off power and pull out plug from power outlet immediately once the product is dropped or is collided extremely. Ask your Sohwa &amp; Sophia Technologies Technology sales office or distributor to repair it.</p>      |  <p>Pull out plug</p>               |
| <p>Cable must be dealt with as below:</p> <ul style="list-style-type: none"> <li>•No damaging;</li> <li>•No re-processing;</li> <li>•No bending forcedly;</li> <li>•No twisting;</li> <li>•No pulling with excessive force;</li> <li>•Avoid putting thing on;</li> <li>•No heating;</li> <li>• Avoid being near any extreme high temperature areas</li> </ul> <p>Observe the above instructions. Failure to do so may result in electrical shock or the risk of fire. If the cable is damaged, please ask your Sohwa &amp; Sophia Technologies sales office or distributor to repair it.</p> |  <p>Prohibit</p>    | <p>Power supply voltage: AC 100V-240V. Be sure to plug in AC 100V-240V power supply outlet for power supply. Any other voltage may cause fire.</p>                                                                             |  <p>Compel</p>                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                        | <p>Make sure to use the equipped AC Adapter. Do not use another type of AC adapter, which may cause damage to the Probe Unit or lead to fire due to high temperature.</p>                                                      |  <p>Prohibit</p>                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                        | <p>Don't touch power plug during thunder and lighting to avoid resulting in electrical shock. If the product is struck by thunderbolt, Ask your Sohwa &amp; Sophia Technologies Technology sales office or distributor to.</p> |  <p>Repair it<br/>Never touch</p> |



## Warning

Always observe the following instructions. Failure to do so may result in electrical shock or other dangers that may lead to serious injury or the loss of life.

Connect frame ground (FG) terminal with Target system and other peripherals devices.  
Failure of FG terminal connection, may result in the risk of electrical shock, malfunction or damage its internal components.



Compel

Keep Frame Ground (FG) away from gas pipe.  
Failure to do so may result in fire or the risk of exploding.



Prohibit

|                                                                                                                                                                                      |                                                                                                   |                                                                                                                                                                                                                                                                 |                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|  <b>Caution</b>                                                                                     |                                                                                                   | Always observe the following instructions to avoid the risk of injury or damage to property.                                                                                                                                                                    |                                                                                                   |
| Turn off power and pull out plug from power outlet when connect/disconnect option.<br>Failure to do so may result in electrical shock.                                               | <br>Compel       | Don't transfer the product with the option connected because the option may drop and lead to injury.                                                                                                                                                            | <br>Prohibit   |
| Avoid pulling the electric cable with extremely force; pull it out by taking the plug on hand.<br>Failure to do so may result in electrical shock, cable damage or the risk of fire. | <br>Prohibit     | Avoid handing power plug with wet hand.<br>Failure to do so may result in electrical shock.                                                                                                                                                                     | <br>Prohibit   |
| Avoid high humidity areas such as bathroom, where may cause in electrical shock.                                                                                                     | <br>No humidity | Keep liquid such as a cup of tea away from the product. Once the liquid is spilt into the product, turn off power and pull out plug from power outlet immediately.<br>Ask your Sohwa & Sophia Technologies Technology sales office or distributor to repair it. | <br>Prohibit  |
| Make sure there are no metals such as staple or clip in the products.<br>Such metals may result in electrical shock or fire.                                                         | <br>Prohibit   | Avoid covering the adapter and product.<br>Failure to do so may result in fire or deform the case due to the extreme high temperature.                                                                                                                          | <br>Prohibit |
| Don't touch AC adapter or product while their power ON duration.<br>Failure to do so may result in the risk of injury.                                                               | <br>Prohibit   | Avoid covering or blocking the ventilation airflow hole if there is any one.<br>Failure to do so may result in fire or deform the case due to the extreme high temperature.                                                                                     | <br>Prohibit |

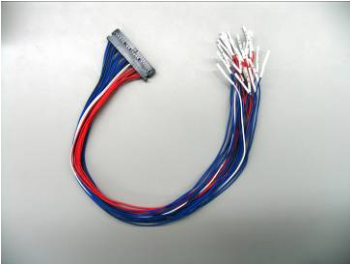
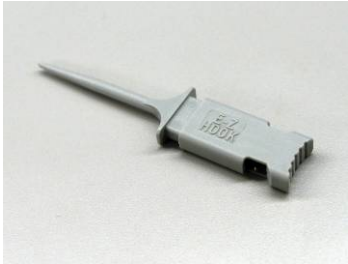
# OPEN THE BOX

## 2.1 Check contents

At first, please check contents.

If contents are not match with this document, or contents has broken, please contact to our sales or distributor.

**This product is precision device. Please carefully use.**  
**Attached AC adapter is for the exclusive use of the Multifunction Analyzer.**  
**You do not use attached AC adapter for another products.**

|                                                                                                                                   |                                                                                                                                                                                                                             |                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <p>(1) Multifunction Analyzer (Qty:1)</p>       | <p>(2) LA*1/PG*2 cable (Qty:1)</p>                                                                                                        | <p>(3) JTAG cable (Qty:1)</p>  |
| <p>(4) Grabber clip (Qty:30)</p>               | <p>(5) AC adapter (Qty:1)</p>                                                                                                            | <p>(6) AC cable (Qty:1)</p>   |
| <p>(7) Simple DC supply connector (Qty:1)</p>  | <p>(8) Documents</p>  <div style="margin-left: 20px;"> <p>* Warranty</p> <p>* Package List</p> <p>* Download site information</p> </div> |                                                                                                                    |

**Fig.2-1 Contents list**

\*1 : LA = Logic Analyzer

\*2 : PG = Pattern Generator



# HARDWARE OVERVIEW

## 3.1 Constitution of product

First, Multifunction Analyzer connect to PC by USB or LAN cable.

- Multifunction Analyzer can be control by application of installed for PC.

Then, connect AC adapter to Multifunction Analyzer.

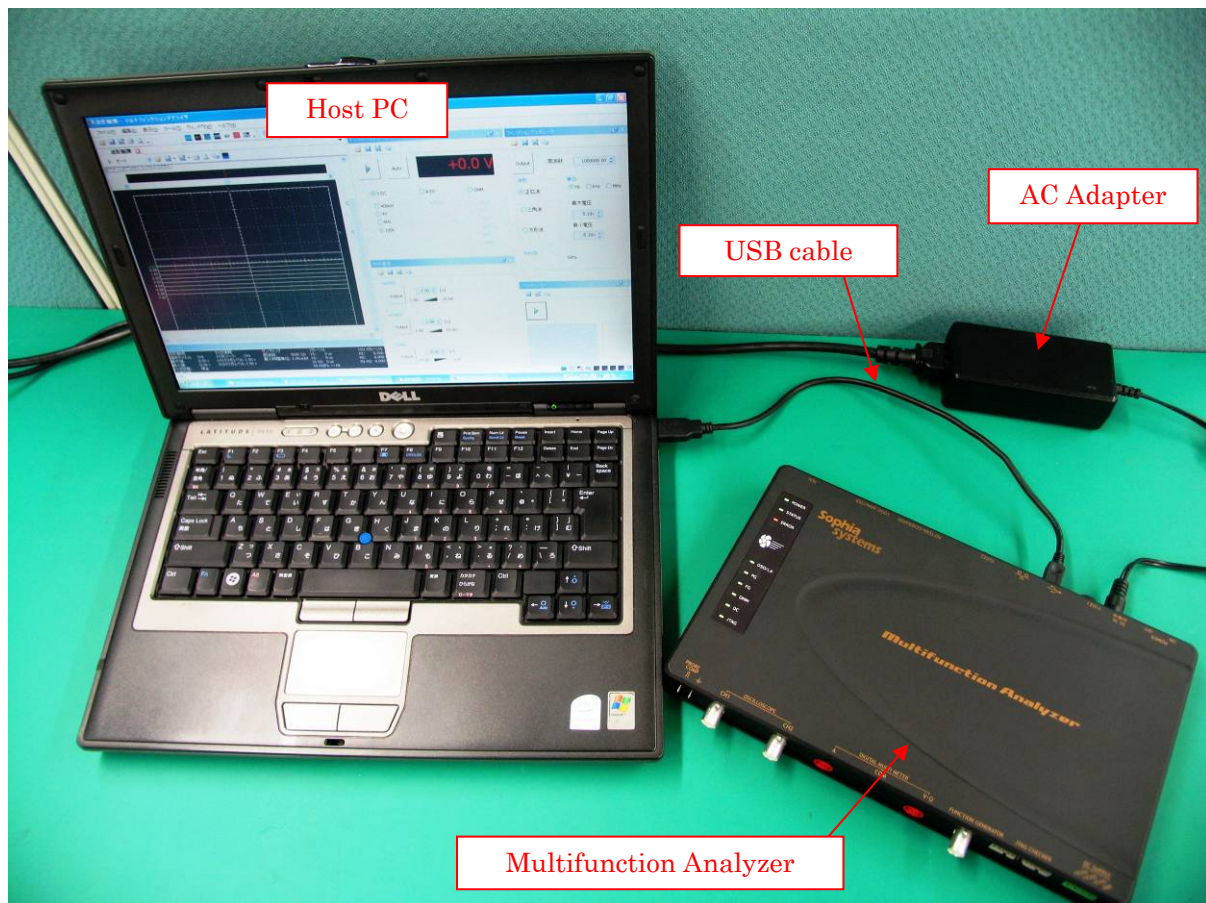


Fig 3-1. Hardware overview (Ex: Connect by USB)

## 3.2 *Elements of constitution*

---

This section explains the elements of constitution of Multifunction Analyzer.

### **[ Host PC ]**

The host PC is desirable to meet the recommended specification in the "Installation manual".

If the host PC not meet recommended specification, probably can operation. But may be unexpected result get you.

### **[ AC adapter ]**

You have to use attached AC adapter, and please connect to a ground when you use.

### **[ Multifunction Analyzer ]**

Multifunction Analyzer has microcomputer for communication to host PC.

### **[ LA/PG cable ]**

LA/PG cable are used for Logic Analyzer and Pattern Generator function. The cable is can directly connect to 0.64mm square pin and phi 0.8mm pin.

You also can connect grabber clips.

### **[ JTAG cable ]**

JTAG cable are used for JTAG checker function. The cable is can directly connect to 0.64mm square pin and phi 0.8mm pin.

You also can connect grabber clips.

### **[ Grabber clip ]**

It will use for LA/PG cable or JTAG cable. Grab pitch is 1.27mm.

### **[ Simple DC supply connector ]**

It will use for simple DC power supply function.

Please screw the cable into the connector.

Please read fourth section of this document for more detail.

## 3.3 Recommended Options

---

Recommended option, accessory and fuse list are shown in below.

**Table 3-1. The list of option, accessory and fuse**

| Items                           | Product number       | Maker              |
|---------------------------------|----------------------|--------------------|
| DSO* <sup>3</sup> Probe         | HP-9250              | Misumi             |
| DSO Differential Probe          | TT-SI 9001           | TESTEC             |
| FG* <sup>4</sup> cable          | TLBNWA-1.5D2V-PPRG-1 | Misumi             |
| DMM* <sup>5</sup> cable (Black) | 4310-2D-IEC-100-0    | Tokiwa & Co., Inc. |
| DMM* <sup>5</sup> cable (Red)   | 4310-2D-IEC-100-2    | Tokiwa & Co., Inc. |
| FUSE1                           | 031202.5MXP          | Littelfuse         |
| FUSE2                           | 02171.25MXP          | Littelfuse         |
| LAN cable                       | LD-CTY/LG2           | ELECOM             |
| USB cable                       | U2C-MF15BK           | ELECOM             |

\*3 : DSO = Digital Storage Oscilloscope

\*4 : FG = Function Generator

\*5 : DMM = Digital Multi Meter

### [ DSO Probe ]

DSO cable are used for Digital Storage Oscilloscope function.

### [DSO Differential Probe ]

DSO cable are used for Digital Storage Oscilloscope function.

### [ FG cable ]

FG cable are used for Function Generator function.

### [ DMM cable (Black/Red) ]

DMM cable are used for Digital Multi Meter function.

### [ FUSE1/FUSE2 ]

Protect from over current.

**[ LAN cable ]**

LAN cable are used for LAN communication.

**[ USB cable ]**

USB cable are used for USB communication.

## 3.4 *Recommended Environment*

---

Recommended environment to use shown in below.

- Do not place near a heater or in direct sunlight.
- Do not use in a place subject to excessive vibration, or extreme high temperatures and low temperatures.
- Do not use this product in a humid place and dusty place, including oil and iron.
- Do not use this product where in place of electrostatics occur.

## PART NAMES AND FUNCTIONS

This section explains of Multifunction Analyzer each part names and functions.

Multifunction Analyzer picture shown in below.

### 4.1 Top of product



**Fig 4-1. Top of product**

**(1) POWER LED**

When power to supply to the multi-function analyzer, it will turn to green.

**(2) STATUS LED**

When communicate to the host PC, it will turn to green.

**(3) ERROR LED**

When error occurred, it will turn to red.

If this LED turns on, please check application.

**(4) DSO/LA LED**

When executing DSO or LA function, it will turn to green.

**(5) PG LED**

When executing PG function, it will turn to green.

**(6) FG LED**

When executing FG function, it will turn to green.

**(7) DMM LED**

When executing DMM function, it will turn to green.

**(8) DC LED**

When executing simple DC power supply function, it will turn to green.

**(9) JTAG LED**

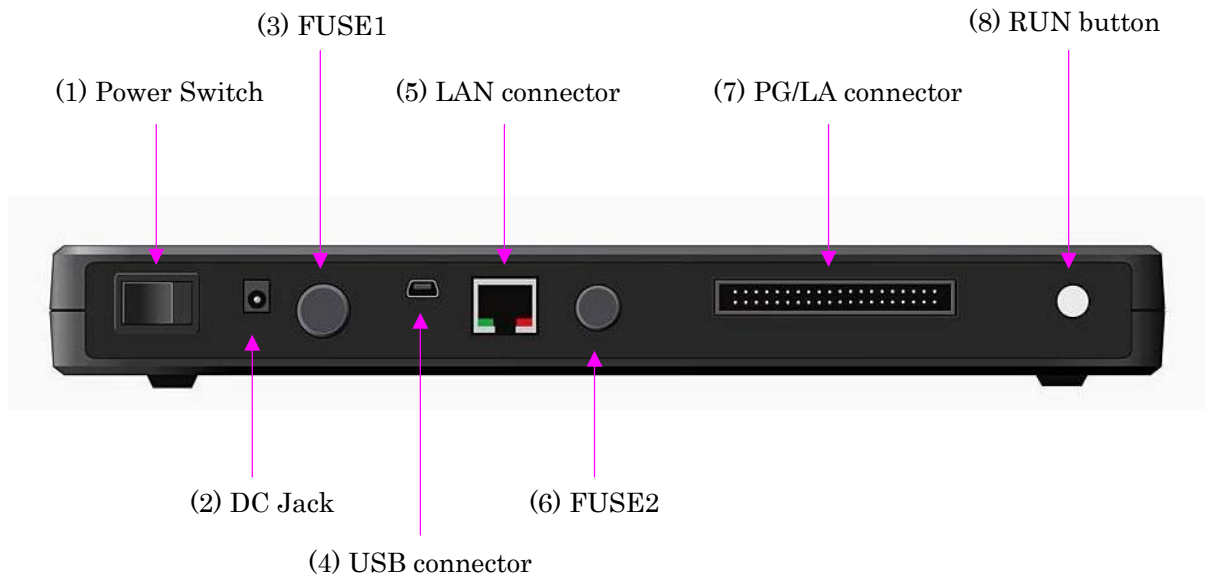
It will turn to green when detect a target board in JTAG checker function.

**(10) Intake/Exhaust Air**

It will make flow of air.

## 4.2 Side1 of product

---



**Fig 4-2. Side1 of product**

### (1) Power Switch

Main power switch of Multifunction Analyzer.

### (2) DC Jack

Main power supply for Multifunction Analyzer.

You have to use attached AC adapter.

### (3) FUSE1

This is FUSE for main power supply.

It will cut off a power when overcurrent occurred.

If you replacing a FUSE1, you have to remove a problem cause.

If you replacing a FUSE, you must be use of 2.5A rated fuse.

Recommended parts refer to section three.

#### **(4) USB connector**

This connector is used for connect to host PC by USB.

Connector type is USB Mini-B.

#### **(5) LAN connector**

This connector is used for connect to host PC by LAN.

This port can accept 10/100BASE specification and also Auto-MDX functions, so you can use straight or cross cable.

Green LED on when network connection is correct.

Orange LED will blink when data transceive.

#### **(6) FUSE2**

This is FUSE for DMM function.

If detect an overcurrent on the connector of current measurement, FUSE2 will cut off.

If it was cut off a FUSE2, you can see about 0mA in current measurement value until replacing a FUSE2.

If you replacing a FUSE2, you have to remove a problem cause.

If you replacing a FUSE, you have to choice more than rated 1.25A.

Recommended parts is shown in the third section.



## (7) PG/LA connector

This port used for PG or LA function.

You can attached a PG/LA cable.

**Table 4-1. PG/LA connector pinout**

| Pin# | Signal Name | Cable Color | Description | Pin# | Signal Name | Cable Color | Description |
|------|-------------|-------------|-------------|------|-------------|-------------|-------------|
| 1    | GND         | -           | GND pin     | 2    | GND         | -           | GND pin     |
| 3    | PG-7        | Red         | PG bit7     | 4    | PG-6        | Red         | PG bit6     |
| 5    | PG-5        | Red         | PG bit5     | 6    | PG-4        | Red         | PG bit4     |
| 7    | GND         | Black       | GND pin     | 8    | GND         | -           | GND pin     |
| 9    | PG-3        | Red         | PG bit3     | 10   | PG-2        | Red         | PG bit2     |
| 11   | PG-1        | Red         | PG bit1     | 12   | PG-0        | Red         | PG bit0     |
| 13   | GND         | -           | GND pin     | 14   | GND         | -           | GND pin     |
| 15   | LA_TRGIN    | White       | EXT pin*1   | 16   | -           | -           | -           |
| 17   | GND         | Black       | GND pin     | 18   | GND         | -           | GND pin     |
| 19   | LA-14       | Blue        | LA bit14    | 20   | LA-15       | Blue        | LA bit15    |
| 21   | LA-12       | Blue        | LA bit12    | 22   | LA-13       | Blue        | LA bit13    |
| 23   | GND         | -           | GND pin     | 24   | GND         | -           | GND pin     |
| 25   | LA-10       | Blue        | LA bit10    | 26   | LA-11       | Blue        | LA bit11    |
| 27   | LA-8        | Blue        | LA bit8     | 28   | LA-9        | Blue        | LA bit9     |
| 29   | GND         | -           | GND pin     | 30   | GND         | -           | GND pin     |
| 31   | LA-6        | Blue        | LA bit6     | 32   | LA-7        | Blue        | LA bit7     |
| 33   | LA-4        | Blue        | LA bit4     | 34   | LA-5        | Blue        | LA bit5     |
| 35   | GND         | Black       | GND pin     | 36   | GND         | -           | GND pin     |
| 37   | LA-2        | Blue        | LA bit2     | 38   | LA-3        | Blue        | LA bit3     |
| 39   | LA-0        | Blue        | LA bit0     | 40   | LA-1        | Blue        | LA bit1     |

\*1 : EXT pin can be used as a external trigger in DSO, LA and PG.

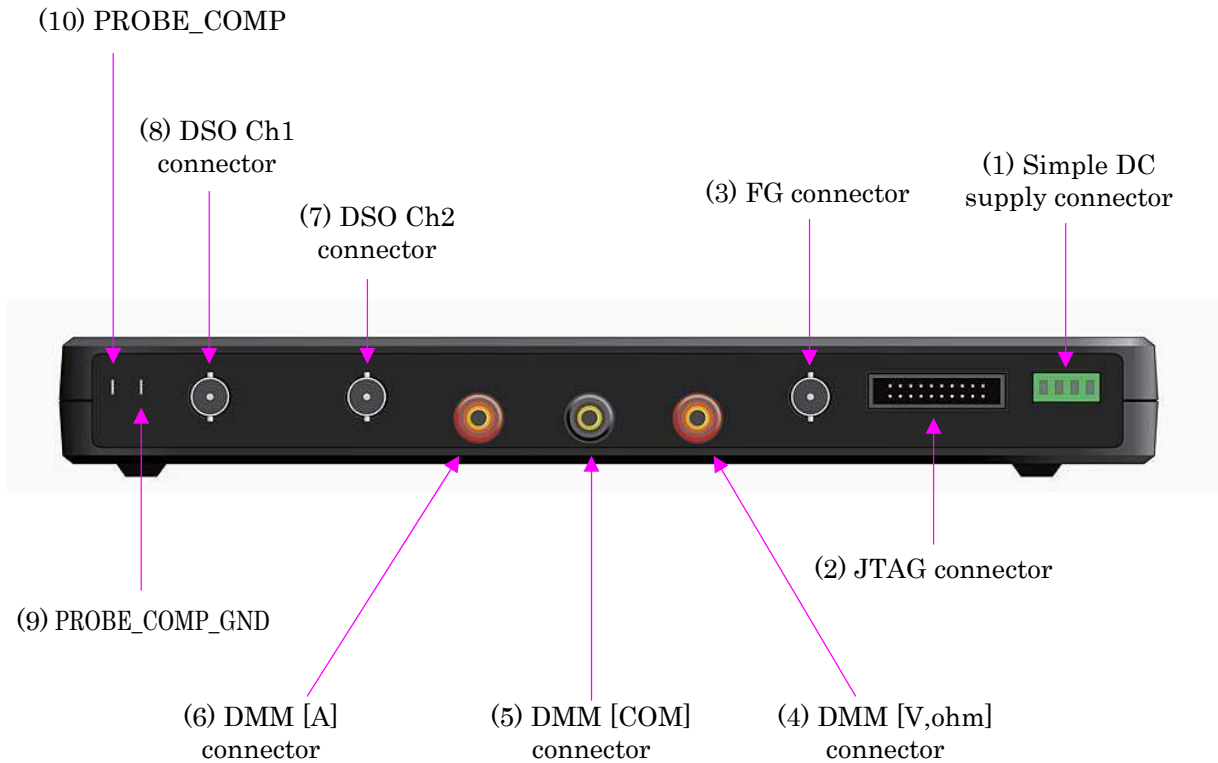
## (8) RUN button

RUN button can control a selected function.

Refer to application's help for more detail.

## 4.3 Side2 of product

---



**Fig 4-3. Side2 of product**

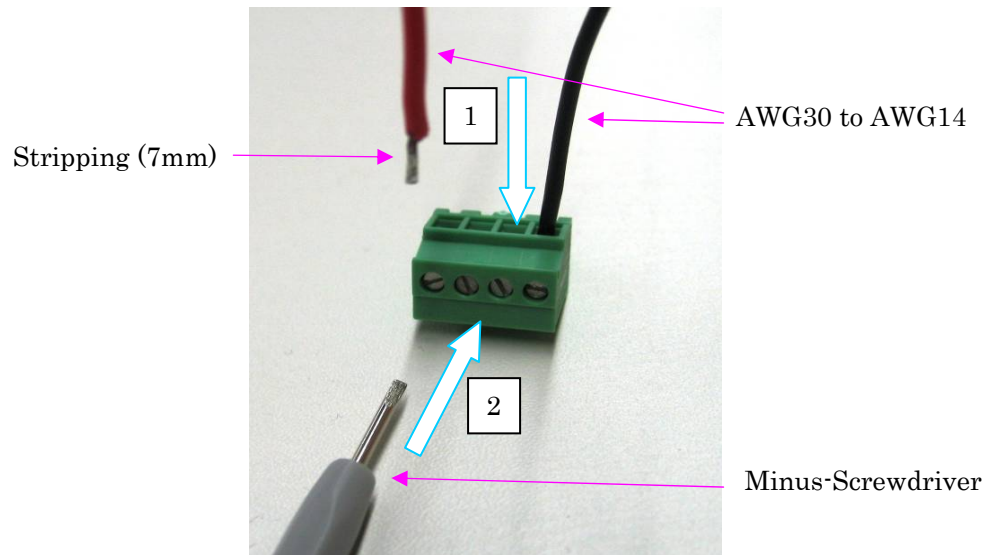
### (1) Simple DC supply connector

This connector is used for simple DC power supply function.

You have to use attached simple DC connector.

Simple DC connector can connect a AWG30 to AWG14 wire.

Please refer to photo in below. You need minus-screwdriver to connect a wire.



**Fig 4-4. How to connect the simple DC connector**

### (2) JTAG connector

This connector is used for JTAG checker function.

You can use JTAG cable of attached.

**Table 4-2. JTAG connector pinout**

| Pin# | Signal Name | Cable Color | Printed | Pin# | Signal Name | Cable Color | Printed |
|------|-------------|-------------|---------|------|-------------|-------------|---------|
| 1    | PWR         | Red         | Vtref   | 2    | PWR         | -           | -       |
| 3    | XTRST-      | Brown       | TRST#   | 4    | GND         | Black       | GND     |
| 5    | XTDI        | White       | TDI     | 6    | GND         | -           | -       |
| 7    | XTMS        | Green       | TMS     | 8    | GND         | -           | -       |
| 9    | XTCK        | Yellow      | TCK     | 10   | GND         | -           | -       |
| 11   | XRTCK       | -           | -       | 12   | GND         | -           | -       |
| 13   | XTDO        | Purple      | TDO     | 14   | GND         | Black       | GND     |
| 15   | XSRST-      | -           | -       | 16   | GND         | -           | -       |
| 17   | XDBG RQ     | -           | -       | 18   | GND         | -           | -       |
| 19   | XDBG ACK    | -           | -       | 20   | GND         | -           | -       |

**(3) FG connector**

This connector is used for FG function.

**(4) DMM [V,ohm] connector**

This connector is used for measurement of voltage value and resistor value by DMM.

**(5) DMM [COM] connector**

This connector is used as COM by DMM.

**(6) DMM [A] connector**

This connector is used for measurement of current by DMM.

**(7) DSO Ch2 connector**

This connector is channel 2 for DSO.

**(8) DSO Ch1 connector**

This connector is channel 1 for DSO.

**(9) PROBE\_COMP\_GND**

This is connected to GND.

**(10) PROBE\_COMP**

This port can calibrate for probe of DSO.

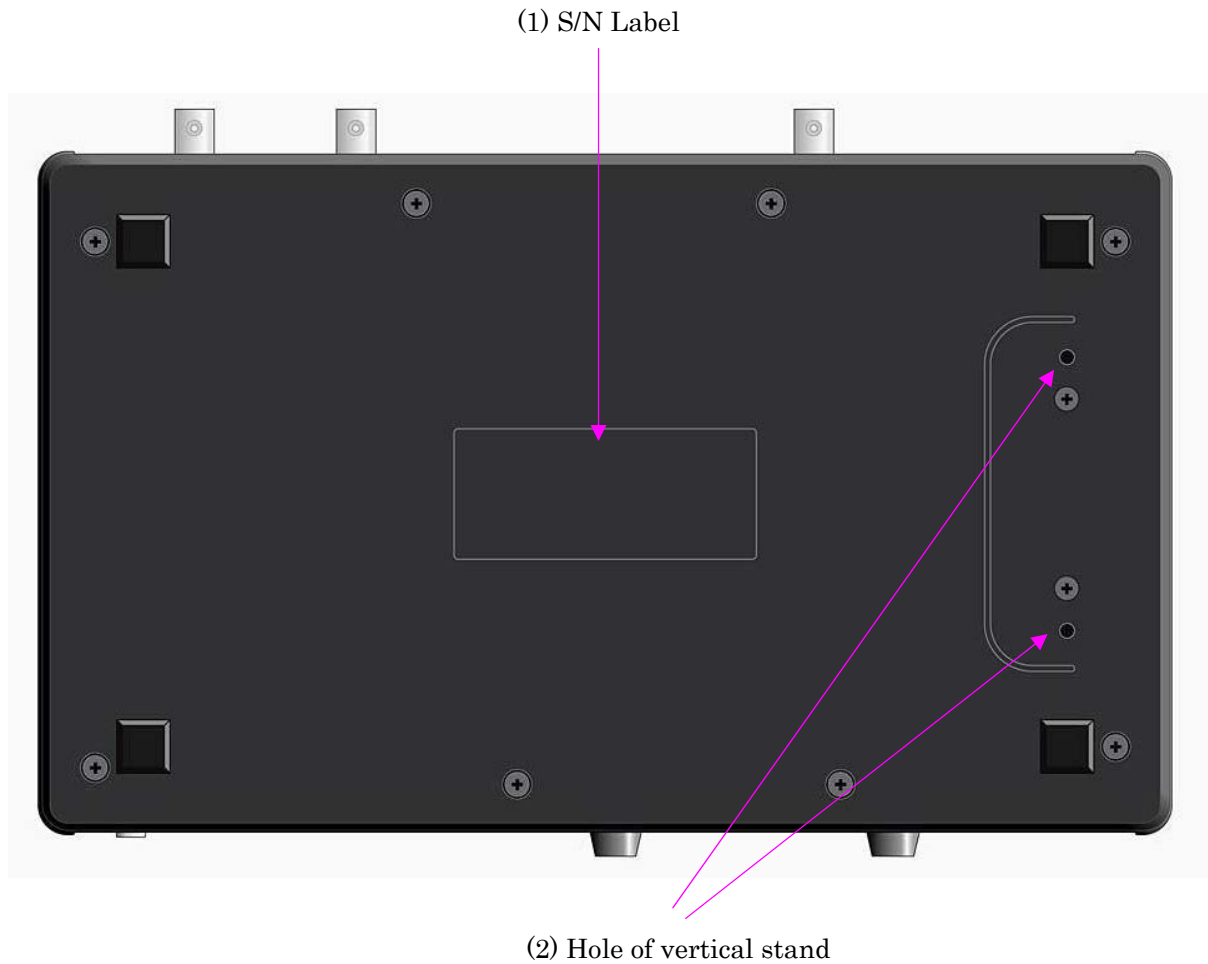
Please refer to manual of probe, if you do calibrate that probe.

**Table 4-3. Specification of PROBE\_COMP**

| Items     | Specification |
|-----------|---------------|
| Voltage   | 3.3V          |
| Frequency | 1kHz          |
| Wave      | Square Wave   |

## 4.4 *Bottom of product*

---



**Fig 4-5. Bottom of product**

**(1) S/N Lable**

This is S/N label.

**(2) Hole of vertical stand**

This hole is used for vertical stand.

## HOW TO CONNECT

### *5.1 How to connect to host PC*

---

This section explains how to connect to host PC.

#### **Connect by USB**

- Please check power of Multifunction Analyzer is off.
- Connect Multifunction Analyzer and host PC by USB cable.
- Connect attached AC adapter and turn on the power.
- Please check power status LED that has been turned on.
- Host PC request a install of device driver at first time connection. Please refer to "Installation manual" and install a USB driver.

**Please refer to "Installation manual" for how to install of USB driver, application.**

#### **Connect by LAN**

- Please check power of Multifunction Analyzer is off.
- Connect Multifunction Analyzer and host PC by LAN cable.
- Connect attached AC adapter and turn on the power.
- Please check power status LED that has been turned on.
- Initial host name is same as S/N. S/N printed on a label on bottom.

# SPECIFICATION

Multifunction Analyzer specification shown in below.

We might changing the specification without any notice for improve quality of this product.

## 6.1 *Common specification*

---

Common specification shown in below.

**Table 6-1. Common Specification**

| Items                     | Specification                                        |
|---------------------------|------------------------------------------------------|
| Operation Temperature     | 0 to 40 degree                                       |
| Continuous Operation time | ≤ 24h                                                |
| Physical Dimensions       | W:270 x D:162 x H:31mm<br>(Protrusions not included) |
| Weight                    | 610g                                                 |



## 6.2 Specification of DSO

---

**Table 6-2. Hardware specification of DSO**

| Items                        | Specification                                                                     |
|------------------------------|-----------------------------------------------------------------------------------|
| Frequency band* <sup>1</sup> | DC to 200MHz                                                                      |
| Channels                     | 2                                                                                 |
| External trigger             | Available                                                                         |
| Sampling rate / ch           | 1.0GS/s                                                                           |
| Record length                | 16K point/ch * <sup>2</sup>                                                       |
| Vertical resolution          | 8 bit                                                                             |
| Vertical sensitivity         | [Probe ATT:x10] 500mV to 10V/div * <sup>3</sup><br>[Probe ATT:x1] 100mV to 5V/div |
| DC vertical accuracy         | ±4%                                                                               |
| Vertical zoom                | It can be zoom-in and zoom-out in stop state.                                     |
| Maximum input voltage        | ±50V * <sup>4</sup>                                                               |
| Position range               | ±4divs                                                                            |
| Input coupling mode          | AC, DC                                                                            |
| Input impedance              | 1M ohm, 12pF                                                                      |
| Horizontal resolution        | 5ns to 2.5s/div                                                                   |
| Horizontal accuracy          | ±0.5%                                                                             |
| Horizontal zoom              | It can be zoom-in and zoom-out in any state.                                      |

\*1 : At 50 ohm impedance.

\*2 : K means 1024 in Decimal.

\*3 : 500mV/div is the magnification of 1.0V/div.

\*4 : Shows the voltage that can be applied between the signal line and GND of the DSO probe.

**Table 6-3. Software specification of DSO**

| Items                        |                 | Specification                                                                                                     |
|------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------|
| Capture mode                 | Sample          | Data sampling only.                                                                                               |
|                              | Single sequence | One time capture when do the trigger sequence by application.                                                     |
| Trigger system               | Trigger mode    | Auto, Normal, Single                                                                                              |
| Trigger type                 | Edge            | Triggered at edge detect.<br>It can to select any channel Rise or Fall point.                                     |
|                              | Pulse width     | Triggered at selected pulse width.<br>("over","under","equal")<br>Pulse width can to set between 1ns and 16384ms. |
| Trigger source               |                 | DSO(2CH), LA(16bit), EXT                                                                                          |
| Cursor                       | Cursor type     | Vertical, Horizontal                                                                                              |
|                              | Display type    | $\Delta V$ , $\Delta T$                                                                                           |
| Automatic measurement        |                 | Max, Min                                                                                                          |
| Waveform math                | Math method     | Addition, Subtraction                                                                                             |
|                              | Math source     | CH1+CH2, CH1-CH2, CH2-CH1                                                                                         |
| Display specification        | Interpolation   | None, Weak, Strong                                                                                                |
|                              | Display mode    | Vector                                                                                                            |
|                              | Persistence     | Off, 100ms, 1s, Eternity                                                                                          |
|                              | Format          | YT                                                                                                                |
| Internal memory (REF memory) |                 | 2 waveform save can.                                                                                              |

## 6.3 *Specification of LA*

---

**Table 6-4. Specification of LA**

| Items                      | Specification             |
|----------------------------|---------------------------|
| Timing analysis            | 1GHz                      |
| Channels                   | 16                        |
| Memory capacity            | 16Kbit / ch               |
| Input voltage range        | 0V to 5V                  |
| Protocol                   | 1.8V, 2.5V, 3.3V, 5.0V    |
| Minimum amplitude          | 1.8V                      |
| Threshold                  | 8ch each                  |
| Bit skew                   | ≤ 8ns                     |
| Input impedance            | ≥ 200k ohm                |
| Trigger source             | DSO (2ch), LA(16bit), EXT |
| Threshold level (Sequence) | 4                         |
| Trigger type               | Logic                     |

## 6.4 Specification of PG

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**Fig 6-5. Specification of PG**

| Items                   | Specification                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Channels                | 8                                                                                                                                                                                                                                                              |
| Data rate               | 5ns to 10ms                                                                                                                                                                                                                                                    |
| Data length             | 16Kbit / ch                                                                                                                                                                                                                                                    |
| Drive strength          | 10mA                                                                                                                                                                                                                                                           |
| Protocol                | 3.3V                                                                                                                                                                                                                                                           |
| Rise time* <sup>1</sup> | Typical : 10ns<br>Worst case : 20ns                                                                                                                                                                                                                            |
| Bit skew                | ≤ 3ns                                                                                                                                                                                                                                                          |
| Trigger source          | DSO(2CH), LA(16bit), EXT                                                                                                                                                                                                                                       |
| Trigger delay           | EXT:<br>Min 100ns (Data rate = 5ns, Horizontal range = 5ns/div)<br>Max 15ms (Data rate = 10ms, Horizontal range = 2.5s/div)<br>LA_DSO:<br>Min 450ns (Data rate = 5ns, Horizontal range = 5ns/div)<br>Max 270ms (Data rate = 10ms, Horizontal range = 2.5s/div) |

\*1 : In case of 5pF load condition.

## 6.5 Specification of FG

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**Table 6-6. Specification of FG**

| Items           | Specification                         |
|-----------------|---------------------------------------|
| Output waveform | Sine wave, Square wave, Triangle wave |
| Channels        | 1                                     |

**Table 6-7. Frequency characteristic of FG**

| Items                |                           |                              | Specification |                         |
|----------------------|---------------------------|------------------------------|---------------|-------------------------|
| Frequency range [Hz] | Frequency resolution [Hz] | Duty/Symmetry resolution [%] | ppm           | Duty/Symmetry error [%] |
| 1M to 100k           | 10k                       | 50                           | ±100          | ±0.5                    |
| 100k to 10k          | 1k                        | 5                            |               |                         |
| 10k to 1k            | 100                       | 1                            |               |                         |
| 1k to 100            | 10                        | 1                            |               |                         |
| 100 to 10            | 1                         | 1                            |               |                         |
| 10 to 0.1            | 0.1                       | 1                            |               |                         |

Can not set duty=0% or duty=100%.

If you want output DC, please set equal to Maximum and Minimum voltage.

**Table 6-8. Waveform characteristic of FG**

| Items         |                       | Specification                                |
|---------------|-----------------------|----------------------------------------------|
| Sine wave     | Harmonic distortion   | $\leq -48\text{dBc}$ (20kHz to 1MHz, 1.0Vpp) |
|               | Non-harmonic spurious | $\leq -40\text{dBc}$ (20kHz to 1MHz, 1.0Vpp) |
|               | Flatness (1kHz base)  | $\pm 1\%$ (0.1dB, <10kHz)                    |
|               |                       | $\pm 3\%$ (0.3dB, <1MHz)                     |
| Square wave   | Rise/Fall time        | $\leq 25\text{ns}$ (50 ohm load, 10Vpp)      |
|               | Overshoot             | $\leq 5\%$ (50 ohm load)                     |
| Triangle wave | Linearity             | $\pm 3\%$                                    |

**Table 6-9. Output specification of FG**

| Items            |            |             | Specification                |
|------------------|------------|-------------|------------------------------|
| Amplitude        | Range      | 50 ohm load | 5.0mVpp to 5.0Vpp            |
|                  |            | Open        | 10mVpp to 10Vpp              |
|                  | Accuracy   | 1kHz        | ±(3%+50mV) of set (≥150mVpp) |
|                  | Resolution |             | 10mV                         |
| DC Offset        | Range      | 50 ohm load | -2.5V to 2.5V                |
|                  |            | Open        | -5.0V to 5.0V                |
|                  | Accuracy   |             | ±(3%+50mV) of set            |
| Output Impedance |            |             | 50 ohm ±3%                   |

## 6.6 Specification of DMM

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**Table 6-10. Voltage Measurement specification of DMM**

| Items                             |       | Specification                                        |
|-----------------------------------|-------|------------------------------------------------------|
| Accuracy                          | 400mV | $\pm(1.2\% + 2\text{dgt})$                           |
|                                   | 4V    | $\pm(1.2\% + 2\text{dgt})$                           |
|                                   | 40V   | $\pm(1.2\% + 2\text{dgt})$                           |
|                                   | 100V  | $\pm(1.3\% + 2\text{dgt})$                           |
| Input impedance                   |       | $\geq 10\text{M ohm}$                                |
| Maximum measurement voltage range |       | 100V                                                 |
| Maximum input voltage range       |       | 150VDC                                               |
| Response time                     |       | 400mV : $\leq 3\text{s}$<br>Other : $\leq 1\text{s}$ |

**Table 6-11. Resistance Measurement specification of DMM**

| Items                          |          | Specification                                                                         |
|--------------------------------|----------|---------------------------------------------------------------------------------------|
| Accuracy                       | 400 ohm  | $\pm(1.2\% + 5\text{dgt})$                                                            |
|                                | 4k ohm   | $\pm(1.2\% + 5\text{dgt})$                                                            |
|                                | 40k ohm  | $\pm(1.2\% + 5\text{dgt})$                                                            |
|                                | 400k ohm | $\pm(1.2\% + 5\text{dgt})$                                                            |
|                                | 4M ohm   | $\pm(2.0\% + 3\text{dgt})$                                                            |
|                                | 40M ohm  | $\pm(3.0\% + 3\text{dgt})$                                                            |
| Maximum measurement resistance |          | 40M ohm                                                                               |
| Open voltage                   |          | $\leq 5\text{V}$                                                                      |
| Measurement current            |          | $\leq 1\text{mA}$                                                                     |
| Response time                  |          | 40M ohm : $\leq 5\text{s}$<br>4M ohm : $\leq 1.5\text{s}$<br>Other : $\leq 1\text{s}$ |

**Table 6-11. Current Measurement specification of DMM**

| Items                       |    | Specification              |
|-----------------------------|----|----------------------------|
| Accuracy                    | 1A | $\pm(3.5\% + 6\text{dgt})$ |
| Maximum measurement current |    | 1A                         |
| Shunt resistance            |    | 0.33 ohm $\pm 1\%^{*1}$    |
| Maximum input current       |    | 1.2A                       |
| Response time               |    | $\leq 1\text{s}$           |

\*1 : Not include FUSE resistance.



## 6.7 Specification of Simple DC supply

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**Table 6-13. Specification of Simple DC supply**

| Items      |                                         | Specification                                                                                         |
|------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| Basic      | Output voltage (CH1,2)                  | 1V to 15V                                                                                             |
|            | Output voltage (CH3)                    | -1V to -15V                                                                                           |
|            | Output current                          | 0mA to 500mA                                                                                          |
|            | Channels                                | 3                                                                                                     |
| CV spec    | Ripple noise (PtoP)                     | $\leq 500\text{mV}_{\text{pp}}$                                                                       |
|            | Load change                             | $\leq 255\text{mV}$                                                                                   |
|            | Rise time                               | $\leq 20\text{ms}$                                                                                    |
|            | Fall time                               | $\leq 600\text{ms}$                                                                                   |
|            | Transient response                      | 4ms(Typ)                                                                                              |
| Accuracy   | Output accuracy<br>(vs Output setting)  | CH1: $\pm(2.3\% + 15\text{mV})$<br>CH2: $\pm(2.3\% + 15\text{mV})$<br>CH3: $\pm(3.2\% + 15\text{mV})$ |
|            | Display accuracy<br>(vs Output voltage) | CH1: $\pm(1.5\% + 5\text{dgt})$<br>CH2: $\pm(1.5\% + 5\text{dgt})$<br>CH3: $\pm(3.5\% + 5\text{dgt})$ |
| Display    | Digits                                  | 3 + 1/2                                                                                               |
| Protection | Overcurrent protection                  | Stop at 1400mA                                                                                        |

## 6.8 Specification of JTAG

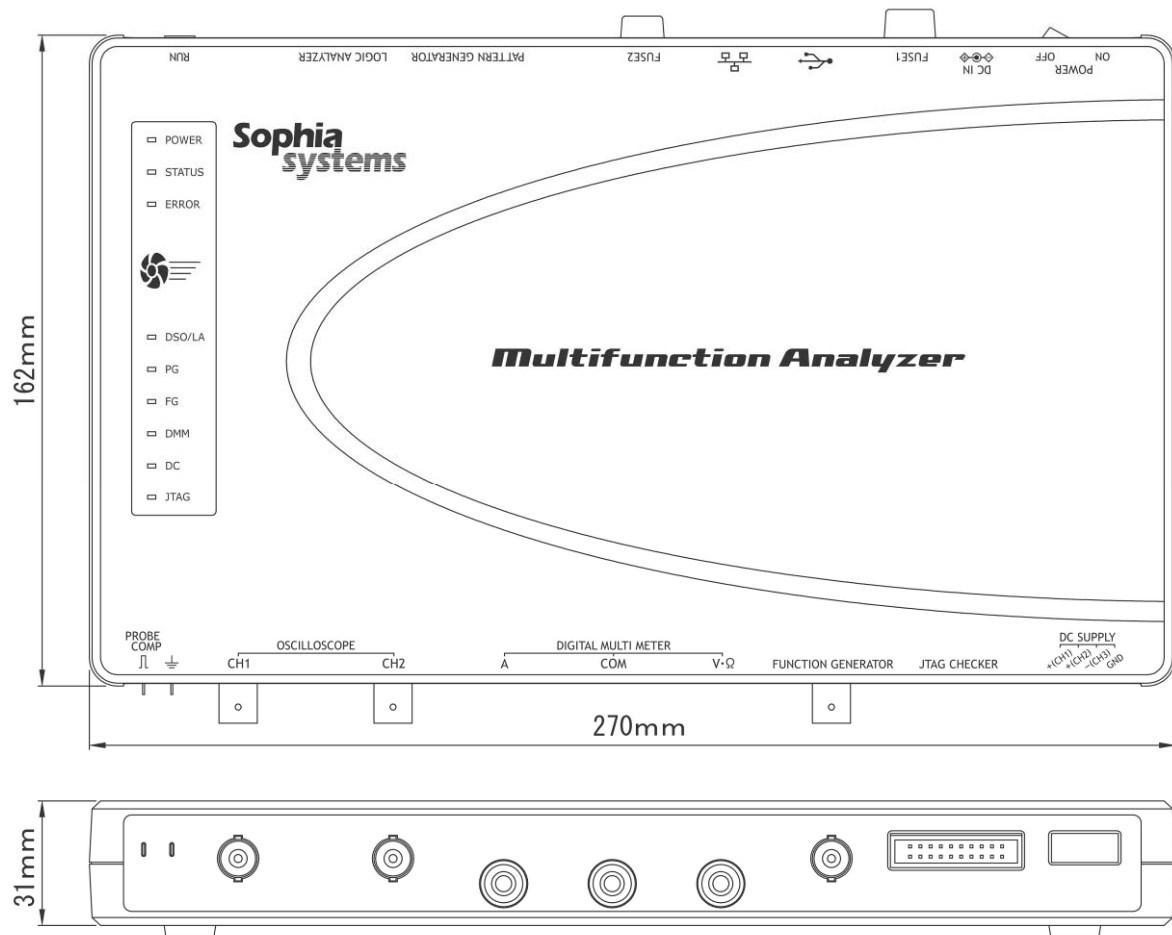
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**Table 6-14. Specification of JTAG**

| Items                | Specification |
|----------------------|---------------|
| Target board voltage | 0.8V to 5.0V  |

## 6.9 Physical dimensions

Physical dimensions are shown in below.



**Fig 6-1. Physical dimensions**

## NOTES

We have the following guidelines when using the Multifunction Analyzer.

### 7.1 *About Hardware*

---

- Product might damage when you connect AC adapter without power switch turn off.
- DC FAN lifecycle is 15000 hours or less.  
If FAN had stopped, you stop using Multifunction Analyzer and please contact our support center. If you keep using, it might be fire or product will be damaged.
- FUSE1 will cut off when overcurrent occurred.  
Especially, if a lot of current is used by simple DC power supply, FUSE1 will cut off easily.  
Power LED doesn't light when FUSE1 has been cut.  
FUSE1 is necessary to use of 2.5A rated fuse.  
Recommended parts are shown in section three.
- FUSE2 will cut off in overcurrent in current measurement mode in DMM.  
If it was cut off a FUSE2, you can see about 0mA in current measurement value until change a FUSE2.  
FUSE2 is necessary to use 1.25A rated fuse.  
Recommended parts are shown in section three.
- The GND terminal must be connected to the ground Surely.  
All of GND terminal can to connect only to the ground.

## 7.2 About DSO

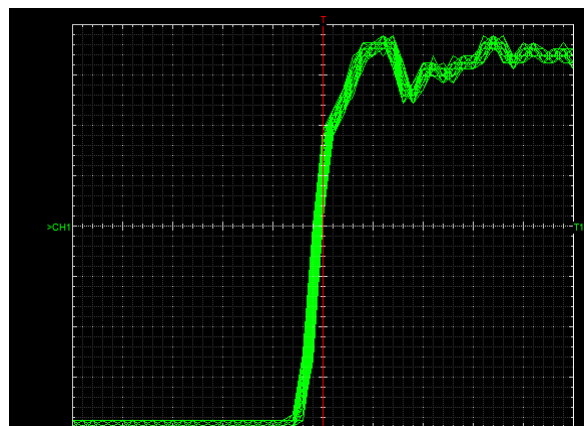
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- When the input signal transient is too fast.

When the input signal transient is too fast, the trigger point of voltage can not display to the point of setting. (Because, since the measured value exceeds the set value voltage of the trigger within one count.)

When measured in the horizontal range 5ns/div, we seem to have delayed 1ns.

Example of the rise form in below. (5ns/div horizontal range, persistence display)

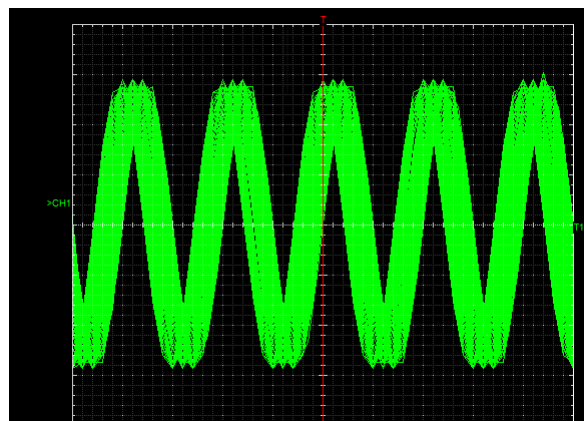


**Fig 7-1. Too fast signal**

- When the input frequency is too fast.

When rising, falling trigger by setting, we measured the high frequency more than 50MHz, it may trigger position is delayed.

Example: When less than 3ns delay 100MHz, 50% of the amplitude of the voltage trigger position.

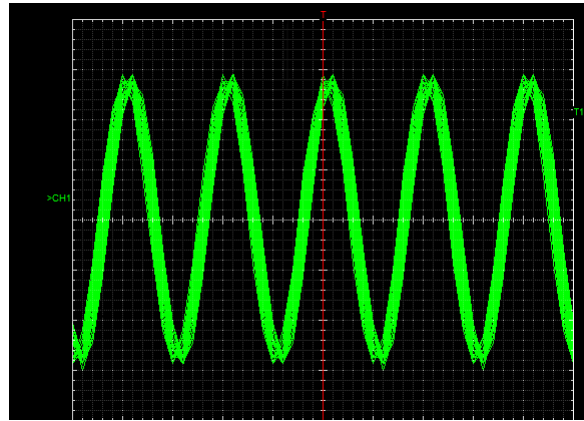


**Fig 7-2. Measured high frequency signal (amplitude is 50% position)**

You can workaround by change the setting for trigger.

- Rise time : Set the trigger to more higher point.
- Fall time : Set the trigger to more lower point.

Example: When less than 1ns delay 100MHz, 90% of the amplitude of the voltage trigger position.



**Fig 7-3. Measured high frequency signal (amplitude is 90% position)**

- Trigger by pulse width.

If you set the trigger pulse width less 50ns/div horizontal range, there is a delay error 5ns.

Example: 100MHz(1 pulse), Trigger width at high level  $\geq 1$ ns, 5ns delay



**Fig 7-4. Pulse width measurement**

## 7.3 *About PG*

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- Do not input reverse current. Product might damaged.

## 7.4 *About FG*

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- Setting of voltage value is of under no load.
- If 50 ohm load connect, voltage will be half.
- Voltage setting value is a rough standard. If you need accuracy, please use while measuring the voltage value.
- Output will be ground level when output stopped.
- If you change the settings in the output, the voltage changes to the GND level at a time.
- Do not short-circuit the output-GND. Product might be damaged.
- Do not connected to target board immediately after the power on or just before power off. After power on or before power off, there might output unexpected voltage.

## 7.5 *About DMM*

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- If you measure voltage 40V or higher, do not touch target terminals. There is risk of get a shock. Very dangerous.
- Do not give 150V or higher to between COM and GND. Product might be damaged.
- If do the resistance measurement you must avoid to give the voltage. Product might be damaged.
- If you use the function of automatic report, especially, be careful about response time. There need to wait for to stable of output because can not get the correct value by Range or Target. Please check about response time before execute the function of automatic report. We recommend to insert a wait time before measurement.  
(DMM to measure the function of automatic report is provided with a one-second delay inside the system.)

## 7.6 *About Simple DC supply*

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- Do not give reverse current by Regenerative circuit, Charger circuit because product might be damaged.
- If you use the function of automatic report, especially, be careful about response time. There need to wait for to stable of output because can not get the correct value by Range or Target. Please check about response time before execute the function of automatic report. We recommend to insert a wait time before measurement.  
(DC to measure the function of automatic report is provided with a one-second delay inside the system.)
- DC LED on when output from simple DC supply.  
Do not touch connector of simple DC supply output when on the DC LED.
- Please consideration current capacities of used cable.  
You have to use AWG26 to AWG14 cable, if 500mA or higher current.

## 7.7 *About JTAG*

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- Do not connected to target board immediately after the power on or just before power off.  
After power on or before power off, there might output unexpected voltage.
- You have to connect the JTAG cable after power off of target board.  
Also, please make the connection from the GND pin when you connect the cable.

## CONTACT US

### Sohwa & Sophia Technologies, Inc.

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#### Headquarters

6-2, Minami-Kurokawa, Asao-Ku, Kawasaki City, Kanagawa Pref, 215-8588, JAPAN

Web : <http://www.ss-technologies.co.jp/en/index.html>

#### Sales office

email : [market@ss-technologies.co.jp](mailto:market@ss-technologies.co.jp)

#### Technical Support Center

email : [tsc@ss-technologies.co.jp](mailto:tsc@ss-technologies.co.jp)